## List of Cross-Reference to Related Applications

Applicant: Robert G. Krestakos
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The present application is a continuation in part of U.S. Pat. Appln. No. 10/076,709, filed on February 15, 2002.

In addition, the present application is related to:

U.S. Pat. Appln. No. 10/367,249, filed on February 14, 2003; and
U. S Pat. Appln. No. 10/077,553, filed on February 15, 2002.

# VARIABLE CONFIGURATION PARTITION SYSTEM

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** The present application is a continuation in part of U.S. patent application No. 10/076,709 entitled "Partition Panel With Modular Appliance Mounting Arrangement", filed on February 15, 2002, the entire contents of which are hereby incorporated by reference. In addition, the present application is related to U.S. patent application No. 10/367,249 entitled "Customizable Portion System", filed on February 14, 2003 and U. S patent application No. 10/077,553 entitled "Panel System", filed on February 15, 2002, the entire contents of which are hereby incorporated by reference.

## STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

**[0002]** Not applicable.

## BACKGROUND OF THE INVENTION

**[0003]** The present invention relates to customizable partition systems adaptable to support a wide variety of options and accessories and more specifically to a system and method for customizing a partition configuration in an easy and intuitive manner.

**[0004]** In the last several decades office space has evolved to accommodate the changing needs of many diverse types of businesses and companies. To this end, mechanical partition systems have been developed that can be used to divide spaces into smaller sub-spaces in many different ways. For example, a space may initially be divided into ten sub-spaces to accommodate ten employees and, as a company grow, the space may be easily reconfigured and divided into fifteen, twenty, etc. sub-spaces to accommodate additional employee requirements. Hereinafter the systems that have been developed to subdivide larger spaces into smaller spaces will generally be referred to as partition systems and the spaces formed by a partition system will be referred to as partition spaces.

**[0005]** Most modern partition systems include some type of electrical and data wiring configurations that provide power as well as computer networking capabilities to the separate partition spaces. Thus, for instance, channels may be provided in a partition wall to route electrical cabling and data lines (e.g., Ethernet) from wall, ceiling or floor outlets that define the larger space to the separate partition spaces. Here, power and networking capabilities can be provided to a host of devices within each space including computers, printers, copiers, fax machines, charging stations (e.g., for a palm type computer, cell phone, MP# player, etc.), phones, HVAC systems, lighting, wireless hubs, etc.

**[0006]** While the partition systems generally described above have many advantages, unfortunately the systems also have several shortcomings. First, while mechanical partition system components have evolved appreciably and are now relatively easy to configure and reconfigure, electrical and data routing and linking methods and configurations used in partition systems have not similarly evolved to become simpler. In this regard, most employees of typical companies are unqualified or, at the very least, are uncomfortable disconnecting data and electrical lines and reconfiguring those lines to move electrical and/or data sockets to other locations within a partition space or to add new data and electrical lines and sockets to partition walls. In fact, in most cases, companies discourage employees from tinkering with data and electrical routings to ensure that unqualified employees do not inadvertently compromise facility systems and network information.

**[0007]** Relatively complex power and data routing systems mean that when a partition system is initially configured, a specially trained information technologist and/or an electrician are typically required to set up the power and data routings within the partition wall members. In addition, whenever an employee wants to move a power or data socket, typically a technologist or electrician has to perform the rerouting process. In many cases the employee must request a reroute well in advance of the reroute actually being performed to get on a technician/electrician's schedule. Systems that require specially trained personnel each time data or electrical linkages are altered are costly.

**[0008]** From a companies perspective these reconfiguration costs often mean that optimal partition configurations are foregone in lieu of existing configurations. For example, where a first space is large enough to accommodate twenty employees but is currently configured to accommodate ten, many companies will simply place

ten employees in a second space instead of reconfiguring and optimizing the first space. As another example, where the closest printer to an employee's partition space is 100 feet down a hall but it would be most efficient for the employee to have a dedicated printer within his space, the company may simply forego long term efficiency that would result from a rerouting to avoid short term rerouting costs. Obvious inefficiencies result when space is not optimally used.

**[0009]** Second, even where companies encourage space and configuration optimization, because employees know that it is a hassle to reroute power and data lines and that rerouting requires the services of one or more trained specialists, often employees simply make due with the configurations they either initially specified or that they inherited from some previous space user. In these cases, work efficiency can be adversely affected. In addition, employees that sense that they cannot be as efficient as possible because of space or environmental constraints end up being resentful (either consciously or unconsciously) and generally unhappy, thereby negatively affecting employee moral and productivity.

**[0010]** Third, recent developments in standard and preferred office equipment and furnishings have had a cluttering effect within many partition spaces. In this regard, the electronics industry has been developing a host of electronic devices and systems that are seen as essential by some employees and as preferred by others including computers, palm computing devices, printers, fax machines, copiers, conferencing (both video and teleconferencing) systems, stereo systems, charging systems, etc. Each of these devices or systems usually requires some desktop space. As partition spaces are becoming smaller and these devices and systems are becoming more plentiful, these devices and systems are requiring a larger relative amount of available space within each partition.

**[0011]** One way to use small partition spaces more efficiently has been to provide shelving and cabinet units that extend from partition walls that can accommodate devices, files and other items above desk top or counter top surfaces. Shelves and cabinets have been useful and are employed by many partition space users but, unfortunately, tend to make already small partition spaces feel even smaller. In addition, shelves and cabinets do nothing to address the problems associated with power and data rerouting.

**[0012]** Fourth, synergies can often be had when two or more electronic devices are linked together to exchange data. For instance, in the case of a palm

type computer that provides several applications and a fully functional desk top computer that provides many more applications, often it is advantageous to sinc information between the two computers such as calendar entries, address book entries, notes, e-mails, etc. Here, typically, a hardwire linkage is required between the two computers to facilitate a sinc activity. As another instance, MP3 players typically require a hardwire linkage to a computer to download music or other data files thereto or therefrom. As more and more electronic devices are developed and become preferred, the "spaghetti" of data linkages and, for that matter, power cords, required to support the devices becomes excessive and further minimizes the sense of space within a small partition space.

**[0013]** Fifth, there are instances in which short term reconfiguration of a space would best suit temporary use of the space. For instance, in the case of a multi-purpose conference room where power point presentations are routinely performed, in the past there have generally been two options. First, the conference room may be equipped with a dedicated computer linked to a projection unit for performing presentations where presentations can be e-mailed or otherwise loaded to the dedicated computer prior to the presentation. In addition, the conference room may also be equipped with a dedicated printer for printing information useful during or after a presentation for distribution. In this case cable linkages between the computer, the printer and the projection unit may be at least semi-permanent and may be hidden in walls or the like to provide a finished and aesthetically optimal appearance to the room. The disadvantage here is that presenters have to use a computer and a printer that they are not completely familiar with. Unfamiliarity often leads to consternation both before and during a presentation. Before a presentation, the presenter often experiences some angst regarding whether or not the presentation program will operate properly on the dedicated hardware, the type of hardware to be used – indeed even standard PCs often provide different interfacing tools such as a mouse, a "joy stick", a small touch pad, etc. for cursor control, etc. During the presentation unfamiliar hardware can cause distracting presentation delays.

**[0014]** Second, the conference room may be set up to allow a presenter to bring in her own personal computer (e.g., a laptop) loaded with a presentation, link up to a conference room projection unit and put on the presentation. The advantage here is that the presenter needn't worry about whether or not a presentation will

operate properly on the computer and the presenter is able to control the presentation via familiar hardware (e.g., the presenter's computer). One disadvantage here is that the task of linking to the projection unit may be confusing and typically requires cable linkages that clutter the conference room space and hence are distracting. Another disadvantage is that other useful capabilities that may be supported within the conference room are often foregone due to perceived difficulties in accessing those functions. For instance, in this case the task of linking to a printer within a conference room is typically perceived as tedious because additional cabling is required, specification of the conference room printer is required, presenters often are unfamiliar with printer operations and capabilities within the conference room, and so on.

**[0015]** On balance, while most conference rooms are wired to support dedicated computers, printers and other devices, most conference rooms are never equipped with such dedicated hardware because of the problems discussed above. Instead, presenters bring their own hardware and the disadvantages associated therewith are accepted.

## BRIEF SUMMARY OF THE INVENTION

**[0016]** It has been recognized that essentially unused space exists inside the walls that comprise most partition systems. It has also been recognized that many electronic and mechanical devices or modules considered optimal or necessary within a conventional office setting can be reconfigured such that the devices can be received and supported at least in part within the unused wall space. In addition, it has been recognized that couplers (e.g., mechanical, electrical, data, etc.) for coupling modules within the alcoves can be standardized structurally and with respect to relative juxtapositions so that different modules can be swapped in and out of the alcoves easily and intuitively by virtually any space user.

**[0017]** Based on the above realizations, at least some embodiments of the present invention includes a system that facilitates easy custom configuration of partition spaces enabling space users to efficiently use the small spaces defined by partition walls. More specifically, in at least some embodiments of the invention, recesses or alcoves are formed within partition walls that include at least a subset of mechanical, electrical and data couplers that are arranged in a pattern that mirrors a

standard module pattern such that when one of the modules is properly plugged into the recess, the mechanical, electrical and data couplers on the module and associated with the recess cooperate to form whatever linkages are required to support the module, provide power to the module and facilitate communication with the module.

**[0018]** Thus, consistent with the above comments, objects of at least some embodiments of the invention include using partition space efficiently. In this regard, instead of using counter or desk top space to store office equipment, devices and modules are stored at least in part within the otherwise un-used spaces that exist within partition walls.

**[0019]** Another object of some embodiments is to reduce the costs associated with installing and customizing partition systems. Here, the modularity and standardized power and data couplers make module swapping simple, intuitive and achievable by most office employees without requiring aid from an electrician or an information technology specialist. A related object is ease of upgrading existing systems.

**[0020]** In at least some embodiments a mechanical locking mechanism is provided that enables a system user to lock modules into partition recesses for security purposes. Thus, in some cases, one other object is to provide a system wherein modules are generally protected from theft.

**[0021]** In some environments it is contemplated that standardized module receiving recesses may be provided at many different locations throughout a facility such that modules may be transported within a facility and linked up to power and data couplers simply and inexpensively. Thus, for instance, a system user that presents a power point presentation may choose to bring the user's printer to a conference room so that hard copies of certain information can be produced as needed. Here, where a properly configured recess exists within the conference room, the user can simply detach the printer from its normal location within a partition recess and mount the printer within the conference room recess. Upon mounting appropriate data and power linkages are formed.

**[0022]** Consistent with the above comments and the following description, at least some embodiments of the invention include a variable configuration assembly comprising a least a first partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a recess opening, at

least a first partition coupler provided proximate the recess, a module having at least a receivable section receivable within the recess and an externally accessible section that is accessible outside the recess when the receivable section is within the recess, at least a first module coupler carried by the module and juxtaposed such that when the receivable section is in a first position within the recess, the first partition coupler and the first module coupler cooperate to maintain the module within the recess and at least a first release member linked to one of the first module coupler and the first partition coupler, the release member including at least an interface section accessible outside the recess when the partition and module couplers are coupled and operable to decouple the first module coupler from the first partition coupler so that the module is removable from the recess.

**[0023]** Here, the recess may have recess width and height dimensions, the module may have module width and height dimensions, the module height dimension may be similar to the recess height dimension and the recess width dimension may be at least 1.5 times the module width dimension. The module width may be formed between first and second lateral module edges, the first module coupler may be spaced from the first lateral edge a first module distance, the assembly may further include at least one aligning indicia on the partition that indicates the first module distance from the first partition coupler so that, when the first edge is aligned with the indicia, the first module coupler and the first partition coupler are aligned.

**[0024]** At least some embodiments further include at least one of electrical and data linkage proximate the recess and the first module includes at least one of a module data connector and a module electrical connector for linking the first modules to the at least one of the electrical and data linkages. In some cases each of electrical and data linkages are provided proximate the recess and wherein the first module includes each of a module data connector and a module electrical connector. In some cases the electrical and data linkages include recess electrical and data connectors, the recess connectors are mounted within the recess at specific positions and, wherein, the recess connectors are juxtaposed with respect to the first partition coupler and the module electrical and data connectors are juxtaposed with respect to the first module coupler such that, when the first module coupler cooperates with the first partition coupler to maintain the receivable section within the recess, the recess connectors and the module connectors link.

**[0025]** Some embodiments further include a pan member mounted within the opening and defining the recess, the first partition coupler provided within a wall of the pan member. Some embodiments also further include at least one filler member forming a fascia surface having a height dimension that is similar to the recess height and a width dimension that is substantially similar to the difference between the recess width and the module width, the assembly also including a first filler coupler carried by the partition member and a second filler coupler carried by the filler member, the first and second filler couplers operable to mount the filler member within the recess opening thereby closing off at least a portion of the opening.

**[0026]** In some embodiments the recess includes first and second opposing edges and the module includes first and second oppositely facing edges that are proximate the first and second opposing edges when the receivable section is in the first position, the first partition coupler includes first and second recesses proximate the first and second opposing edges, respectively, the first module coupler includes first and second extension members carried proximate the first and second oppositely facing edges and receivable within the first and second recesses, respectively.

**[0027]** In some cases the first extension member is a movable member and is mounted to the module for movement along a coupling axis between extended and retracted positions wherein, when the receivable section of the module is in the first position and the movable member is extended, the movable member is received in the first opening and, when the receivable section of the module is in the first position and the movable member is retracted, the movable member is outside of the first opening. Here a biasing member may be included for biasing the moveable member into the extended position. Also, here, the release member may be linked to the movable member and may be operable to move the movable member from the extended position to the retracted position.

**[0028]** Some embodiments include a locking member operable via a key wherein the locking member is useable to lock the release member such that the module coupler and partition coupler remain coupled until the key is used to unlock the couplers.

**[0029]** At least some embodiments of the invention include a variable configuration assembly comprising at least a first partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a

recess opening wherein the recess opening has a recess width dimension and a recess height dimension, the recess width dimension being at least a multiple of a minimum width dimension wherein the multiple is at least two, at least a first partition coupler provided proximate the recess, a module having at least a receivable section receivable within the recess and an externally accessible section accessible outside the recess when the receivable section is within the recess, the module having a module width dimension and a module height dimension wherein the module width dimension is the minimum width dimension and at least a first module coupler carried by the module and juxtaposed such that when the receivable section is in a first position within the recess, the first partition coupler and the first module coupler cooperate to maintain the module within the recess.

**[0030]** In addition, some embodiments of the invention include a variable assembly for use with at least a first partition member and a first partition coupler, the partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a assembly comprising a module having at least a receivable section receivable within the recess and an externally accessible section that is accessible outside the recess when the receivable section is within the recess, at least a first module coupler carried by the module and juxtaposed such that when the receivable section is in a first position within the recess, the first module coupler cooperates with the partition coupler to maintain the module within the recess and at least a first release member linked to the module coupler and including at least an interface section accessible outside the recess when the partition and module couplers are coupled and operable to decouple the first module coupler from the first partition coupler so that the module is removable from the recess.

**[0031]** Moreover, at least some embodiments of the invention include a variable configuration assembly for use with at least one module and at least one module coupler, the at least one module having at least a receivable section and an externally accessible section, the module coupler carried by the module, the assembly comprising a least a first partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a recess opening for receiving the receivable section of the module, at least a first partition coupler provided proximate the recess and juxtaposed so that when the receivable section is in a first position within the recess, the first partition coupler and the first module

coupler cooperate to maintain the module within the recess and at least a first release member linked to one of the first module coupler and the first partition coupler, the release member including at least an interface section accessible outside the recess when the partition and module couplers are coupled and operable to decouple the first module coupler from the first partition coupler so that the module is removable from the recess.

**[0032]** Furthermore, some embodiments of the invention include a variable configuration assembly for use with at least one module and at least one module coupler, the at least one module having at least a receivable section and an externally accessible section, the module coupler carried by the module, the module having a width dimension that is a minimum width dimension, the assembly comprising at least a first partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a recess opening wherein the recess opening has a recess width dimension and a recess height dimension, the recess width dimension being at least a multiple of the minimum width dimension wherein the multiple is at least two, at least a first partition coupler positioned proximate the recess, the first partition coupler juxtaposed so that when the receivable section is in a first position within the recess, the first partition coupler and the first module coupler cooperate to maintain the module within the recess.

**[0033]** In addition, some embodiments of the invention include a variable configuration assembly for use with at least one module, at least one module coupler and at least a first partition member, the at least one module having at least a receivable section and an externally accessible section, the module coupler carried by the module, the module having a width dimension that is a minimum width dimension, the at least first partition member being one of a wall member, a floor member and a ceiling member and forming a partition recess having a recess opening, the assembly comprising a pan member receivable within the partition recess and securable to the partition member, the pan member forming a pan recess that extends into the partition recess and having a pan recess width dimension that is at least a multiple of the minimum width dimension wherein the multiple is at least two, at least a first partition coupler positioned proximate the pan recess, the first partition coupler juxtaposed so that when the receivable section is in a first position within the pan recess, the first partition coupler and the first module coupler cooperate to maintain the module within the pan recess.

**[0034]** Moreover, some embodiments of the invention include a variable configuration assembly comprising a least a first partition member being one of a wall member, a floor member and a ceiling member and forming a recess having a recess opening, at least a first partition coupler provided proximate the recess, a module having at least a receivable section receivable within the recess and an externally accessible section that is accessible outside the recess when the receivable section is within the recess, at least a first module coupler carried by the module and juxtaposed such that when the receivable section is in a first position within the recess, the first partition coupler and the first module coupler cooperate to maintain the module within the recess and at least a locking member operable via a key to lock the receivable section within the recess.

**[0035]** These and other objects, advantages and aspects of the invention will become apparent from the following description. In the description, reference is made to the accompanying drawings which form a part hereof, and in which there is shown a preferred embodiment of the invention. Such embodiment does not necessarily represent the full scope of the invention and reference is made therefore, to the claims herein for interpreting the scope of the invention.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

**[0036]** Fig. 1 is a partially exploded, perspective view of a partition panel system with a modular appliance mounting arrangement embodying the present invention;

**[0037]** Figs. IA-1AE are perspective views of modules according to the present invention;

**[0038]** Fig. 2 is a front elevational view of a partition frame; Fig. 3 is a top plan view of the partition frame of Fig. 2; Fig. 4 is a bottom plan view of the partition frame of Fig. 2;

**[0039]** Fig. 5 is a right elevational view of the partition frame of Fig. 2;

**[0040]** Fig. 6 is an enlarged view of a portion of the partition frame of Fig. 2;

**[0041]** Fig. 7 is a fragmentary, top plan view of a structural intermediate horizontal beam;

**[0042]** Fig. 8 is a front elevational view of the structural intermediate beam of Fig. 7; Fig. 9A is a cross-sectional view taken along the line IX-IX; Fig. 8;

**[0043]** Fig. 9B is a schematic view of the partition frame of Fig. 2;

**[0044]** Fig. 10 is an exploded, fragmentary view showing an intermediate beam having a safety clip;

**[0045]** Fig. 11 is a fragmentary view of a partition frame with two modules mounted thereto;

**[0046]** Fig. 12 is a fragmentary, perspective view of a module having storage features;

**[0047]** Fig. 12A is a cross-sectional view of a tray and lid taken along the line XIIA-XIIA; Fig. 12;

**[0048]** Fig. 13A is a fragmentary view of a module having power and data outlets and wire management features;

**[0049]** Fig. 13B is a schematic view of the cover panel that may be utilized to close off the module of Fig. 13A;

**[0050]** Fig. 14 is a fragmentary view of the cover panel mounting bracket of Fig. 13 taken along the line XIV-XIV;

**[0051]** Fig. 15 is a fragmentary, perspective view of a module having a flat screen display and articulating support arm;

**[0052]** Fig. 16 is a perspective view of the articulating support arm of Fig. 15 in the fully extended position;

**[0053]** Fig. 17 is a perspective view of the articulating support arm of Fig. 15 in the fully retracted position;

**[0054]** Fig. 18 is a fragmentary, exploded, perspective view of a portion of the arm assemblies of Fig. 15;

**[0055]** Fig. 19 is a schematic top view of the friction rollers of Fig. 18;

**[0056]** Fig. 20 is an exploded, fragmentary; perspective view showing the friction rollers of Fig. 18;

**[0057]** Fig. 21 is a schematic end view of a partition panel showing a pair of modules mounted on opposite side of the partition panel;

**[0058]** Fig. 22 is a perspective view of a second embodiment of a cover panel mounting bracket;

**[0059]** Fig. 23 is a perspective view of a second embodiment of a cover panel mounting bracket;

**[0060]** Fig. 24 is an exploded perspective view of another alternate embodiment of a cover panel mounting bracket;

**[0061]** Fig. 25 is a perspective view of the cover panel mounting bracket of Fig. 24;

**[0062]** Fig. 26 is an exploded perspective view of the cover panel mounting bracket of Fig. 24 from a rear side thereof;

**[0063]** Fig. 27 is a side view of the bracket of Fig. 22 illustrating the installation of the bracket between a pair of horizontal beams;

**[0064]** Fig. 28 is a side view of the bracket of Fig. 22 illustrating the installation of the bracket between a pair of horizontal beams;

**[0065]** Fig. 29 is a view similar to Fig. 11, albeit illustrating another embodiment of the present invention;

**[0066]** Fig. 29A is a fragmentary view of a partition frame with a pan assembly mounted therein and with various components shown in phantom;

**[0067]** Figs. 30A and 30B are perspective views of an exemplary pan assembly according to at least one embodiment of the present invention;

**[0068]** Fig. 31 is a perspective view of the pan assembly of Fig. 30 albeit from a generally rear vantage point;

**[0069]** Fig. 32 is a partial cross-sectional view of an exemplary module mounted within the pan assembly of Fig. 30;

**[0070]** Fig. 33 is an enlarged view taken along the line 33-33 in Fig. 29A;

**[0071]** Fig. 34 is a perspective view of an exemplary module assembly according the present invention;

**[0072]** Fig. 35 is a perspective view of the assembly of Fig. 34 from a rear vantage point;

**[0073]** Fig. 36 is a perspective view of the module of Fig. 34 from yet another vantage point;

**[0074]** Fig. 37 is an enlarged partial cross-sectional view taken along the line 37-37 in Fig. 32 with a mechanical coupler configuration shown in a latched position;

**[0075]** Fig. 38 is similar to Fig. 37, albeit illustrating a mechanical coupler configuration in an unlatched position;

**[0076]** Fig. 39 is a plan view of one of the power/data couplers illustrated in Fig. 35;

**[0077]** Fig. 40 is a perspective view of a rail assembly that may be mounted within a partition recess according to one embodiment of the present invention;

**[0078]** Fig. 41 is a plan view of a channel including indicia according to one aspect of at least some embodiments of the present invention;

**[0079]** Fig. 42 is similar to Fig. 41, albeit illustrating a segmented channel;

**[0080]** Fig. 43 is an end view of a locking button;

**[0081]** Fig. 44 is a side plan view of the button of Fig. 43;

**[0082]** Fig. 45 is a top plan view of the button of Fig. 43;

**[0083]** Fig. 46 is a partial cross-sectional view taken along the line 46-46 in Fig. 47B; and

**[0084]** Fig. 47A is an enlarged partial cross-sectional view of a button assembly in a locked orientation, Fig. 47B shows the assembly of Fig. 47A in an un-locked orientation and Fig. 47C shows the assembly unlocked with the button pressed.

## DETAILED DESCRIPTION OF THE INVENTION

**[0085]** For purposes of description herein, the terms "upper, " "lower, " "right, " "left, " "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the invention as oriented in Fig. 1. However, it is to be understood that the invention may assume various alternative orientations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

**[0086]** Referring now to the drawings wherein like reference numerals reference similar element throughout the several views and, more specifically, referring to Fig. 1, the present invention will be described in the context of an exemplary partition system 1 that includes a plurality of partition frames 3, cover panels 6 and 10, a desk top structure 5 and modules (e.g., a flat screen assembly 7, a power assembly 8, a storage assembly 9, etc.). The partition frames 3 are generally securable together to divide a larger space into partition spaces suitable as office spaces or the like. The cover panels 6 mount to either side of each partition frame thereby providing a measure of privacy for a person within the partition space.

The desk top structure 5 mounts to one or more of the partition frames at a standard desk top height and forms a desk top working surface (also referred to by numeral 5) within the partition space.

**[0087]** The modules 7, 8, 9, etc., are receivable within spaces defined by various partition frame members (e.g., 4), are mechanically held in place by mechanical couplers and, where power and/or data linkage is required, are coupled to power and/or data lines 76, 77, respectively, via power and/or data couplers. In the embodiment illustrated in Fig. 1, partition frame recesses for receiving modules are shown as being just above the standard desk top height. Although not illustrated, it is contemplated that the heights of recesses formed by the frames 3 may be different in other embodiments and, indeed, that in some embodiments, a partition frame may include recesses at several different heights such as, in addition to the desk top height, below desk top height and/or near or at the top of the partition frame 3. Other exemplary mounting space or recess heights are described in greater detail below.

**[0088]** Cover panels or filler members 6 and 10 include generally rectangular substantially rigid members. A set of panels will typically include several different sizes including large size full width "segmented" cover panels 6 and smaller sizes 10 utilized to close off gaps that otherwise exist adjacent modules 7, 8, 9, etc. Cover panels 10 have the same height as the modules and a width as required to close off the gap between the vertical side edge of the module and an adjacent vertical frame member 12. If required for a particular application, a plurality of modules may be mounted to a partition frame 3 in a side-by-side manner extending across the entire width of the frame 3, such that smaller cover panels 10 are not required. Although the modules 7, 8 and 9 are illustrated as being positioned at the same height, as described in more detail below, the modules may be positioned at various heights as required by a user.

**[0089]** Referring now to Figs. 1 and 2, each partition frame 3 includes a pair of vertical side frame members 12, upper and lower horizontal frame members 13, 14, respectively, and, in the illustrated embodiment, a pair of intermediate cross members 4. Each of the upper and lower members 13 and 14 extend between and rigidly interconnect to the vertical side frame members 12 to form a generally rectilinear structure. As described in detail in the above-referenced co-pending U.S. patent application entitled PANEL SYSTEM, vertical side frame members 12 include

a plurality of openings 15-18 and horizontal frame members 13 and 14 include a plurality of openings 19 and 20 for mounting cover panels 6, 10. The openings 15-20 receive clips (not shown) that extend from the rear surfaces of the cover panels 6, 10 to thereby retain the cover panels 6, 10 on a partition frame 3.

**[0090]** Referring to Fig. 5, the vertical side frame members 12 include a plurality of openings 21 that permit utility lines such as power and/or data lines to be fed horizontally through vertical frame members 12 between adjacent partition frames 3. Similarly, upper frame member 13 includes openings 22 (Fig. 3), and lower frame member 14 includes openings 23 (see Fig. 4) to permit vertical pass-through of power and/or data lines at the upper and lower edges, respectively, of partition frame 3. A channel 24 (see Fig. 5) extends along the upper horizontal frame member 13 to facilitate horizontal lay-in of utility lines 77 along the upper edge of partition frame 3. Similarly, vertical side frame members 12 include vertically extending channels 25 (see Fig. 3) to permit vertical routing of utility lines along the side edges of partition frame 3.

**[0091]** Each of the intermediate cross members 4, like the upper and lower members 13 and 14, respectively, is rigidly connected to and between vertical members 12. Each intermediate member 4 includes upper and lower pluralities of openings 20 and 19 that are similar to the openings formed by members 13 and 14 and that are provided for mounting cover panels 6, 10. The openings 19 and 20 are formed to receive the clips that extend from the rear surfaces of the cover panels 6, 10 to thereby retain the cover panels 6, 10 on partition frame 3.

**[0092]** Although not shown, each of intermediate members 4 includes openings like openings 22 and/or 23 to permit vertical pass-through of power and/or data lines toward the other of members 4 or upward/downward toward the upper and lower members 13 and 14, respectively, as required.

**[0093]** Referring still to Figs. 1 and 2, upper horizontal cross member 13 forms a horizontal row of slots 27 (Fig. 2), lower horizontal cross member 14 forms a row of horizontal slots 28 and each of intermediate members 4 forms a horizontal row of slots 26 that are essentially equi-spaced along the lengths thereof. In addition, each vertical side frame member 12 forms a vertical row of essentially equi-spaced slots 29 that extend essentially along the entire length thereof. Referring also to Fig. 10, vertical frame member 12 includes openings 39 and 40 that align with the horizontal row of slots 26 formed by each of the intermediate cross members 4 to provide

continuous horizontal rows of slots without "dead zones" at the vertical frame members 12. Slots 26 through 29 may be used for supporting hang-on furniture units such as the desk top 5 illustrated in Fig. 1 file cabinet units, shelves, etc.

**[0094]** With further reference to Fig. 6, each of horizontal cross members 4, 13 and 14 include sets of openings or mounting apertures 31 at regularly spaced intervals. In the illustrated embodiment, each set of openings 31 is repeated every six inches along each of the horizontal frame members 4, 13 and 14. The regularly spaced openings 31 define a plurality of discrete, serially adjacent mounting spaces 32. In at least some embodiments of the invention openings 31 receive well-nuts or conventional self-tapping screws or the like to secure the modules to the partition frame 3. The mounting spaces 32 receive the modules 7, 8, etc. For example, the power and data module 8 illustrated in Fig. 1 may have a width of twelve inches and take up two of the mounting spaces 32. Alternately, the module may have a width of twenty-four inches, such that the module takes up four of adjacent mounting spaces 32.

**[0095]** The modules can be mounted at a selected horizontal position in one or more of the mounting spaces 32, such that the horizontal position of the module can be selected to meet the needs of a particular user and/or application. Also, as described in more detail below, a single intermediate beam 4 may be mounted adjacent one of frame members 13 or 14 such that a module may be mounted adjacent the upper or lower edge of the frame 3 by securing a module to the openings 31 in the intermediate beam 4 and frame member 13 or 14.

**[0096]** With further reference to Figs. 7 and 8, each intermediate beam 4 includes a pair of hooks 34 at the opposite ends of the beam. With further reference to Fig. 10, vertical side frame members 12 include openings 35 that receive hooks 34 of the intermediate beams 4 to thereby retain the intermediate beams 4 on the vertical frame members 12.

**[0097]** A flexible safety catch 36 is made of spring steel or the like, and is spot welded or otherwise attached to the intermediate beams 4 at the locations marked 37. The safety catch 36 includes a tab 38. During installation, during insertion of hooks 34 in openings 35, tab 38 contacts the vertical frame member 12 and flexes outwardly in the direction of the arrow "A". As the intermediate beam 4 is shifted downwardly to engage hooks 34, tab 38 snaps into opening 35. The tab 38 prevents upward shifting and inadvertent dislodgment of hooks 34 from the openings 35. To

remove an intermediate beam 4 from a vertical beam 12, the flexible safety catch is manually flexed such that the tab 38 is disengaged from opening 35, thereby permitting disengagement of hooks 34 from openings 35.

**[0098]** Each of the illustrated vertical frame members 12 includes a plurality of openings 35 at equal vertical intervals, such that one or more intermediate beams 4 can be positioned at a selected height on partition frame 3. In the illustrated example, the vertical spacing between the pairs of openings 35 is 12.360 inches, such that intermediate beams 4 can be positioned at 12.360 inch intervals on the vertical side frame members 12.

**[0099]** Each vertical side frame member 12 includes a set of openings 35 spaced 12.360 inches from the upper horizontal frame member 13, and another set of openings 35 spaced 12.360 inches away from the lower horizontal cross member 14, such that an intermediate beam 4 can be mounted to the frame 3 12.360 inches away from upper frame member 13 and/or lower frame member 14. Upper frame member 13 and lower frame member 14 also include openings 31 (see also Fig. 2A) for mounting modules. Each set of four openings 31 in the frame member 13, 14 and intermediate beams 4 are spaced at six inch intervals, such that the modules can be positioned on six inch increments at any selected horizontal position.

**[00100]** A horizontal row of mounting spaces 32 can be provided along the upper and/or lower portions of the partition frame 3 if required for a particular application. Thus, the horizontal location of the module can be varied by positioning the module in a selected space 32. Also, the intermediate beams 4 can be vertically positioned at a selected height, such that the modules can be readily mounted at selected vertical and horizontal positions.

**[00101]** Fig. 9B schematically illustrates the grid of module mounting spaces and cover panel configurations provided by the vertically adjustable intermediate beams and horizontally spaced mounting openings 31 in the intermediate beams 4 and upper and lower frame members 13, 14. In Fig. 9B, each set of mounting openings 35 in the vertical frame members 12 are designated 35A, and each set of mounting openings 31 in the intermediate beams and frame members 13 and 14 are designated 31A. In the example of Fig. 9B, the intermediate beams are designated 4A, 4B and 4C. As discussed above, the sets of openings 31A are spaced at six inch horizontal intervals, designated S1, and the sets of openings 35A are spaced at 12.360 vertical increments, designated S2.

**[00102]** Intermediate beams 4 can be attached to selected ones of the sets of openings 35A thereby providing a plurality of attachment locations 125 that may be utilized by connecting an intermediate beam to a selected set of openings 35A in the vertical frame members 12. Attachment locations 125 form a grid defining a plurality of mounting spaces 32A. Consistent with the discussion above, each mounting space 32A in the illustrated example has a width of six inches and a height of 12.360 inches. As discussed above, the modules may have a width of six inches, twelve inches, eighteen inches, twenty-four inches or any other multiple of six inches. In the example of Fig. 9B, a full width cover panel 6A has a height dimension S2 and extends across the entire width of frame 3. A mounting space 32B having a width of twelve inches is provided between shorter width cover panels 10A and 10B immediately below the full width cover panel 6A. A second mounting space 32C having a twenty-four inch width is provided between cover panels 10C and 10D below the vertical location of mounting space 32B and associated panels 10A and 10B. A full width cover panel 6B closes off the lower portion of partition frame 3, and has a height dimension of two times S2.

**[00103]** The partial width cover panels 10A–10D may have a width of six inches, twelve inches, or any multiple of six inches to close off the gap or gaps along the side or sides of a module that is mounted in a mounting space 32. Thus, prefabricated partial width cover panels of six inches wide, twelve inches wide, eighteen inches wide, and each additional multiple of six inches can be provided, each having a height dimension S2. Similarly, prefabricated full width cover panels 6 having heights S2, and each multiple of S2 may also be provided. Thus, the modules for a particular workspace or other such application can be selected to suit a user's needs.

**[00104]** The horizontal and vertical locations of the modules can be selected and the required number of intermediate beams 4 can be mounted to the frame 3 at the desired vertical location(s). The required number and sizes of cover panels can then be selected and installed to close off the spaces that are not occupied by a module.

**[00105]** Hereinafter, the remainder of this section of the specification is divided into two parts including specification from an earlier related application and new specification that, while related to the earlier application, includes exemplary embodiments most clearly articulated in this application.

**[00106]** **Earlier Described Concepts**

With reference to Fig. 11, power and/or data module 8 includes an upper flange 41, and a lower flange 42, each of which has at least two clearance openings 43. The openings 31 in intermediate beams 4 receive conventional well-nuts (not shown), and conventional threaded fasteners such as bolts or the like (also not shown) that extend through the clearance openings 43 in flanges 41 and 42 to thereby secure the power and/or appliance module in the mounting space 32. Alternately, self-tapping screws or other conventional fasteners may be received in openings 31 to secure the modules to the partition frame.

**[00107]** Housing 44 of module 8 includes a front face 45 having openings 46 and 47 for mounting power receptacles 48 and data receptacles, respectively. A large opening 50 through the front face 45 permits pass-through of power and/or data lines from the interior space of the partition frame to the exterior. A bezel 67 may be releasably secured to the housing 44 and/or partition frame 3 to cover the housing 44 and close off opening 50. Bezel 67 includes an opening 68 to provide user access to power receptacles 48 and data receptacles 49. A pair of wire managers 69 extend around opening 68. Wire managers 69 are horizontally spaced from the front face 67A of bezel 67 such that utility lines such as power line 81 can be routed between a wire manager 69 and the face 67A of bezel 67.

**[00108]** Module 8 may also comprise a display screen 51 (Fig. 11) that is connected to a programmable computer (not shown). Display screen 51 may be a touch screen permitting users to, for example, reserve a conference room for a meeting or the like.

**[00109]** A left hand cover panel bracket 52 and a right hand cover panel bracket 53 are mounted on the intermediate horizontal beams 4, and extend between the intermediate beams 4 to provide a mounting location for the smaller fill-in cover panels 10 and/or 11. Brackets 52 and 53 each include a plurality of openings 54 that receive conventional threaded fasteners (not shown) that are threadably received in the conventional well nuts (not shown) that are positioned in the openings 31 of the intermediate beams 4. The illustrated brackets 52 and 53 each include cover panel mounting openings 15, 16, 17 and 18 having the same configuration as openings 15, 16, 17 and 18 in frame members 12, such that cover panels 10 can be mounted to the cover panel brackets 52 and 53. This arrangement permits the cover panels 10 to have the same mounting clip and construction as the

full width segmented cover panels 6. Furthermore, the cover panel mounting brackets 52 and 53 ensure that the vertical side edges of the cover panels 10 directly adjacent the modular appliance remains securely mounted to the frame 3, and does not bow outwardly or otherwise create an unsightly appearance. The left hand and right hand cover panel brackets 52 and 53 may optionally include a cutout 55 that permits wiring to be passed from within the panel outwardly between the cover panels 10 and the vertical side member 56 of the cover panel bracket 52 and/or 53.

**[00110]** With further reference to Fig. 12, the module may also comprise a storage unit 9. In the illustrated example, the storage unit 9 has a width of about twenty-four inches, and includes "shoebox" shaped housing 58 with flange 57 extending upwardly from housing 58, and a lower flange 59 extending downwardly from housing 58. Each of the flanges 57, 59 includes a plurality of fastener openings 61 that receive a conventional threaded fastener that is threadably received into a conventional well-nut that is positioned in the openings 31 in the intermediate horizontal beams 4. Alternately, as discussed above, self tapping screws or the like may be utilized to secure the modules to the frame.

**[00111]** The housing 58 of storage unit 9 includes one or more vertical center walls 62, vertical side walls 63, horizontal lower side wall 63A, upper horizontal side wall 6313, and vertical rear wall 63C. The walls 62 and 63 each include a plurality of horizontally extending flanges 64 forming slots 64A that may be used to support trays 65, paper holder 66, and the like. Paper holder 66 includes a plurality of vertical wires 66A, downwardly angled wires 6613, and horizontal wires 66C that are configured to retain a plurality of papers, files, and the like in a generally upright position. The walls 62, 63 and slots 64A may be configured to slidably support a compact disk ("CD") jewel box 6413.

**[00112]** A right hand cover panel bracket 53 and/or left hand panel bracket 52 are mounted directly adjacent the storage unit 9 to provide an attachment location for the cover panels 10. Trays 65 may have generally vertical side walls 65A forming a shallow, upwardly opening cavity 65B. A lid 60 (see also Fig. 12A) may be removably positioned on tray 65 to close off cavity 65B. Lid 60 is flat, and includes an opening 60A through the central portion to provide a finger grip for a user. A small step 65D extends around the upper edge 65E of walls 65A to support and position lid 60 with upper surface 6013, thereof generally flush with upper edge 65E. The shelves 65 may have an overall front to rear dimension that is greater than the

depth of the housing 58, such that the forward portion 65C of the tray 65 extends outwardly beyond the peripheral edge 58A of the housing 58. As illustrated in Fig. 1, storage unit 9 may optionally include a door 82 that pivots between open and closed positions to selectively close off at least a portion of housing 58.

**[00113]** Storage unit 9 may also include a pencil holder 130, a telephone holder 131, and a hanging file holder 132. Pencil holder 130 includes a flat upper portion 133 with opposite side edges 134 that support pencil holder 130 in slots 64A. Telephone holder 131 includes a housing 135 having at least a pair of opposed edges that engage slots 64A on opposite sides of a vertical center wall 62. Hanging file holder 132 is formed from wire, and includes horizontal hanger portions 137 that support standard hanging file folders 138. Walls 62 may include a plurality of openings 139 therethrough, each of which is positioned adjacent rear wall 63C and slots 64A. During installation, ends 140 of hanging file holder 132 may be flexed . inwardly and inserted into openings 139 to thereby support file holder 132. When installed, vertical portions 141 of file holder 132 extend adjacent rear wall 63C, with the lower portion of vertical portions 141 contacting rear wall 63C to prevent rotation about ends 140. Horizontal portions 142 of holder 132 extend outwardly to position file holder 132. Paper holder 66 includes a somewhat similar mounting arrangement, except that a vertical wire 66A contacts the storage unit 9 adjacent the lower edge of housing 58 to prevent rotation of holder 66. As discussed above, the various modules can be mounted at various horizontal locations along the intermediate beams 4, and cover panels 10 of standard size are then utilized to fill in the gaps defined between the module and the vertical side frame members 12.

**[00114]** With further reference to Fig. 13A, a second embodiment 70 of the power and/or data modular appliance may include a plurality of flanges 57, 59, each having one or more openings 61 that receive conventional threaded fasteners for securing the power and data module 70 to the intermediate beams 4 in substantially the same manner as described above in connection with the storage module 90. Module 70 includes a main housing 71 and a vertically extending inner housing 71A that supports power receptacles 73 facing sidewardly on each side of the housing 71A. A pair of vertical side wall portions 74 may be utilized to mount data outlets 75 facing inwardly along the opposite sides of module 70. The electrical power lines 76 connect to the electrical power system 76A (Fig. 1) extending along the base. Similarly, data lines 77 can be extended along the top edge of the panel system.

Alternately the power lines 76 and data lines 77 supplying the panel system may be routed internally through the openings 21 (see also Fig. 5) in the vertical side frame members 12.

**[00115]** Main housing 71 includes upper and lower horizontal walls 71B, 71C, respectively, and a vertical rear wall 71D. Upper and lower walls 71B and 71C include an elongated opening 72 to permit vertical routing of power lines 76 and/or data lines 77 from within main housing 71 to the interior space of the partition panel. Large openings 71E may also be provided along the sides of main housing 71 to permit horizontal routing of power lines 76 and/or data lines 77. A fill-in cover panel 10 having the same width as the power and data module 70 can be mounted to the intermediate beams 4 to close off the module 70, such that a pair of side-by-side fill in cover panels 10 close off the interior space between the intermediate beams 4.

**[00116]** With reference to Fig. 14, skin bracket 53 may optionally include a hook 78 that may inserted into an opening 31. The bracket 53 is then shifted in the direction of the arrow "B" to align the openings 54 in bracket 53 with the openings 31 in the intermediate beam 4 and/or 5. One or more conventional threaded fasteners 79 are then inserted through the openings 54 and 31, and threaded into a conventional well nut 80. Alternately, conventional self-tapping screws not shown) may be driven into openings 31 to secure the modules to the partition frame.

**[00117]** With further reference to Fig. 15, a flat screen monitor appliance module 7 includes a housing 85 extending between the intermediate beams 4 and 5. The housing 85 includes upper and lower flanges 86 and 87, each having a plurality of clearance holes 88 that receive threaded fasteners that extend into well nuts positioned in the openings 31 in the intermediate beams 4 and 5. A flat screen monitor 92 is secured to the housing 85 by first and second support arm assemblies 90 and 91. First arm assembly 90 includes a first link 93 and a second link 94. Similarly, the second arm assembly 91 includes a first link 95 and a second link 96. The first links 93 and 95 are pivotally connected to a base bracket 97 by hinges 98 and 99. First link 93 is pivotally connected to second link 94 by a hinge 100. Similarly, first link 95 is pivotally connected to second link 96 by a hinge 101.

**[00118]** The outer ends 105 and 106 of second links 94 and 96, respectively are pivotally connected to a bracket 102 by hinges 103 and 104, respectively formed in link member 109. A thumbscrew 111 or the like extends through openings 113 in clevis 114 of bracket 102, and through opening 112 in link member 109 to permit tilt

adjustment of screen 92 about a horizontal axis. Thumbscrew 111 may be tightened to secure screen 92 at the desired angle. An elongated slide member 115 includes a channel 116 having opposed grooves 117. When assembled, grooves 117 receive edges 11,80 bracket 10, and openings 119 in slide member 115 align with openings 120 in bracket 102. Threaded fasteners or the like extend through openings 119 and 120 to interconnect bracket 102 and slide member 115. A connector bracket 121 forms a channel 122 that slidably receives the slide member 115 to provide height adjustment of screen 92. A thumbscrew 123 or the like secures the screen 92 at the desired height. Bracket 121 includes flanges 124 that include openings 125 for mounting screen 92 on bracket 121. With further reference to Fig. 17, a cable management loop 126 is secured to bezel 110. Power lines 127. or the like may be routed through the loop 126 to ensure that the lines do not interfere with the user's other equipment and/or activities. The first and second arm assemblies 90 and 91 support the flat screen 92 for horizontal movement between the fully extended position illustrated in Fig. 16, and the fully retracted position illustrated in Fig. 17. A recess 107 is formed in the face 108 of a bezel 10 that mounts to the frame 3, and/or brackets 52, 53. When in the fully stored position of Fig. 17, the arm assemblies 90 and 91 are, received within the recess 107 to permit the screen 92 to be positioned directly adjacent the partition panel 2 to which it is attached.

**[00119]** Flat screen assembly 7 of Fig. 15 may include a pair of friction rollers 115 made of rubber or other electrometric material at hinges 98 and 99. With further reference to Figs. 18 through 20, links 94 and 96 each include a hexagonal cast boss 151 that is integrally formed with the link. The friction rollers 150 include a hexagonal opening 152 therethrough having slightly smaller overall size than the boss 151, such that the roller 150 is secured to the boss 151 by a tight interference fit when installed. With reference to Fig. 19, the distance "D" between the center of the two rollers 150 is slightly less than the diameter of the rollers 150, such that the rollers 150 are elastically deformed at the contact area 153 between the two rollers 150. This interference fit between the adjacent rollers 150 creates friction to control extension and retraction of the flat screen 92 and prevent excessive inadvertent movement thereof.

**[00120]** Instead of the left and right hand cover panel brackets 52 and 53 discussed above, an alternate embodiment 160 of the cover panel bracket may be utilized in both a left hand and right hand configuration (i.e., on either side of a

module). Cover panel bracket 160 includes a front web 161, a pair -of vertically extending side webs 162, an upper web 163, and a lower web 164 forming a shallow "shoebox" shape. Mounting openings 165-168 through the front web 161 recite mounting clips to retain cover panels 10 adjacent a module. The openings 165-168, and cover panel mounting clips are described in detail in the above-identified co-pending application entitled PANEL SYSTEM, previously incorporated herein by reference.

**[00121]** Side webs 162 are cut out at 172 to provide for routing of utility lines 175 therethrough to or from the adjacent module if required. With further reference to Figs. 24-26, a second embodiment 180 of the bracket cover panel mounting bracket of Figs. 22 and 23 is substantially the same as bracket 160, except that bracket 180 includes an enlarged cutout portion 181 through the front web 161 and side web 162 to permit lay-in of utility lines 175, such as data or power lines. A small strip 182 can be installed across the cutout 181 after the utility lines 175 are installed by placing the ends 183 of strip 182 in openings 184. The strip 182 provides a visual block between the edge of the cover panel 10 and the adjacent module, by extending across the gap between the module and the cover panel. An upwardly extending tab 185 similarly provides a light blocking function.

**[00122]** With further reference to Figs. 27 and 28, bracket 160 may be installed between a pair of adjacent beams 4 by first inserting upwardly extending tab 169 into an opening 186 in lower surface 187 of the uppermost beam 4. The lower end 188 of bracket 160 is then rotated inwardly in the direction of the arrow "A" (Fig. 27) until the bracket 160 is vertically aligned in the position illustrated in Fig. 28. The bracket 160 is then shifted downwardly in the direction of the arrow "B" to engage the tabs 170 in openings 189 in upper side 190 of the lower beam 4. A plurality of threaded fasteners 191 are then inserted through the openings 174 (Fig. 23) in the lower web 164 of bracket 160 and into the corresponding openings 192 in the upper side 190 of the lowermost bracket 4. Threaded fasteners 191 may be self-tapping screws, well-nuts, or other such conventional fastener. During installation of fasteners 191, the installer may utilize the access opening 173 and cutouts 172 to provide access for the wrench, screwdriver, or the like. The fasteners 191 ensure that the bracket 160 is rigidly secured to the beams 4, without rattles or the like. Bracket 180 is installed in substantially the same manner as just described for bracket 160.

**[00123]** The modules of the present invention permit various such units to be mounted within the partition panel itself, thereby reducing the work surface space that would otherwise be required for such units. The intermediate beams 4 can be positioned at various vertical heights, and the modules can be secured to a pair of intermediate beams 4 at the selected vertical position. Alternately, the modules may be secured to an upper frame member 13 and an intermediate beam 4, or, the module may be secured to an intermediate beam 4 and the lower horizontal frame member 14. Still further, the modules can be positioned horizontally in a selected mounting space 32. Accordingly, the present invention permits a wide variety of modular modules to be positioned at virtually any horizontal or vertical position within the partition panels 2 utilizing a common mounting arrangement. The common mounting arrangement permits the various types of modules to be interchanged/moved as required. Furthermore, because the modules are mounted at standard positions, and have standard sizes, fill in panels having standard widths and heights can also be provided to quickly fill in any gaps between the modules and the adjacent vertical frame members.

**[00124]** In addition to the flat screen module 7, the power and data module 8 and the storage module 9 described above, additional modules may be utilized to provide a wide variety of features to enhance the partition space environment. Exemplary modules according to the present invention are illustrated in Figs. 1A through 1AE. The modules may comprise various high tech devices to facilitate data flow through the adjacent work areas and the like. Other electronic modules may be utilized to control the temperature, noise, or other environmental conditions within the work area to thereby optimize a user's comfort and productivity. A module comprising a "Polycom"-style voice conferencing system 1A suitable for small group space is illustrated in Fig. 1A and an integrated Plantronics-style wireless headset 1A that reduces clutter from around a phone is illustrated in Fig. 1B. A small touch screen appliance 1C for the communication of graphic, video and audio data is illustrated in Fig. 1C and a module with an integrated, vertically oriented printer 1D for personal printing is illustrated in Fig. 1D. Data lines for the printer and the touch screen appliance are routed within the partition frame system in a manner described in greater detail below.

**[00125]** Modules for controlling noise within the work area include a white noise generator IE to reduce perceived distraction by increasing the ambient noise level as

illustrated in Fig. 1E. A wall-mounted speaker 1F with controls 2F is illustrated in Fig. 1F. The horizontally and vertically selectable mounting arrangement of the modules permits optimal positioning of the speakers 1F in the workspace where partition frames 3 form recesses at different vertical heights.

**[00126]** Various wireless network hubs may be utilized to facilitate wireless communication within a partition space or proximate thereto. Wireless network hubs can be selectively mounted at an optimum vertical and horizontal position without cluttering the workspace. A module comprising an integrated OEM Bluetooth, 802.11, or other wireless networking hub 1G is illustrated in Fig. 1G. The distribution of this hub is based on coverage area and the number of devices in use. The Bluetooth unit may be mounted adjacent the upper edge of the partition to properly position the antenna. An infrared network hub is illustrated in Fig. 1H. The IR hub may be mounted at a standard desk top height to provide line-of-sight access to peripherals. A USB hub II with integrated cable management is illustrated in Fig. 1I.

**[00127]** A status indicator 1J for phone, privacy, voicemail, etc. is illustrated in Fig. 1J. The status indicator is illustrated as being positioned at the upper edge of the partition panel, and a light or the like indicates a phone-in-use condition to others proximate the indicator. Fig. 1K shows a passive-infrared motion detector that may be operatively connected to an alarm system, lighting control, and occupant status and location information. A thermometer and thermostat for controlling local heaters and fans to provide an optimal work environment is illustrated in Fig. 1L.

**[00128]** A module comprising a distributed temperature sensor with display is illustrated in Fig. 1M. The distributed temperature sensor provides for control of the HVAC system within the office area. An infrared control/light switch for overhead lighting is illustrated in Fig. 1N. The lighting system used with the IR control is outfitted with an IR receiver, and implicit zonal control of the overhead lighting system can be achieved by modifying the shape of the IR beam. Still further, a tip-out lighting fixture to provide both task and ambient light is illustrated in Fig. 1O. The tip-out lighting fixture may be a low voltage halogen unit providing optimum lighting conditions on the work surface without cluttering the work surface. With reference to Fig. 1P, a small space-heater 1P with an integrated thermometer may be utilized to provide consistent temperature control within the work area. Louvers for directing the flow, a control for the speed, and optional remote temperature sensor and/or control is also illustrated in Fig. 1P. The space-heater may be a two way heater

providing heat to both sides of the partition. The modular mounting feature permits positioning of the heater at an optimal location, such as directly below the work surface or adjacent the lower edge of the partition. A fan to provide airflow directed at the occupant and louvers to control direction/flow rate is illustrated in Fig. 1Q. The fan is preferably capable of providing slow airflow, and may be mounted above the work surface.

**[00129]** Other modules according to the present invention facilitate routing, access, and management of utility lines in the work area. A slatwall support surface 1R with translucent tilt-away section 2R for access to power and/or data receptacles positioned within the partition panel is illustrated in Fig. 1R. The slatwall facilitates utilization of space behind the surface. A cable trough 1S for management of peripheral cables 2S and the like within the beltway 3S is illustrated in Fig. 1S, and a storage cabinet 1T with a pivotally mounted whiteboard door surface 2T is illustrated in Fig. IT. The storage cabinet provides convenient, private storage of personal items such as medicines, keys, and the like, as well as office items.

**[00130]** With reference to Fig. 1U, the module may comprise a storage unit IU with a clear panel 2U for display purposes. Various personal or decorative items may be placed in the storage unit for display to personalize the work area. A secure storage cabinet 1 V with lockable door 2V and adjustable shelves 3V is illustrated in Fig. 1V. A module comprising a receptacle 1W for papers, magazines, and the like is illustrated in Fig. 1W, and a "mail-slot" module 1X is illustrated in Fig. 1X. A retaining member 2X is pivotally mounted at the lower portion thereof to permit pass-through of papers 3X or the like between co-workers or from a public to a private space.

**[00131]** Various other types of modules may also be utilized to control, monitor and/or restrict access and/or privacy between adjacent workspaces as required for a particular application or office environment. For example, a small window providing visual and aural access through the panel is illustrated in Fig. 1Y. With reference to Fig. 1Z, a small window 1Z provides controlled visual access through the panel by using an LCD glass panel 2Z that can be made clear rather than translucent. With further reference to Fig. 1AA, a window 1AA provides visual and aural access through the panel with access being controlled by a tambour door 2AA. With reference to Fig. 1AB, a small window 1AB provides visual and aural access through the panel with access being controlled with a mini-blind shade 2AB. A window 1AC

with a dot-pattern screen to provide limited visibility through the panel is illustrated in Fig. 1AC. Rather than replacing a full-size window, these windows allow for discreet communication between adjacent workspaces.

**[00132]** In addition to the access and/or privacy control arrangements described above, the modules may also comprise various seating units or the like that may be utilized to provide seating space for users when required, yet be storable in the partition when not required to conserve space. With reference to Fig. 1AD, a fold-out seat 1AD may be utilized to accommodate temporary visitors. The fold-out seat allows for group interactions without having to find an extra chair when working individually. A fold-out seat to accommodate group seating for temporary visitors is illustrated in Fig. 1AE. Such accessory units facilitate movement of objects and workflow off the desktop or work surface and into the partition panel.

**[00133]** Moreover, a web sign or digital display of some type may also be provided in module form. Web signs and digital displays are well known in the visual arts. Thus, a wide range of modules may be provided as required by a particular user.

**[00134]** **Additional Concepts**

While the embodiments described above offer many advantages over known prior art, the task of swapping a first module for a second where the first or second module or both the first and second modules require data and/or power correction is still relatively complex and requires an amount of networking and power grid knowledge that most office employees lack.

**[00135]** To overcome the complexities associated with configuring/ reconfiguring partitioned spaces to customize those spaces, the present invention also contemplates a modular type system where modules such as printers, personal stereos, computing devices, heater units, fan units, etc., are easily mounted to, and dismounted from, a recess formed by a partition panel and wherein proper data and electrical connectivity is made whenever a module is mechanically mounted within a recess. To this end, referring now to Figs. 29 through 38, modules (e.g., 266) are provided that include first and second (e.g., top and bottom) oppositely facing edges and a mechanical coupler mechanism that includes first and second extension members (e.g., 310 and 282) carried proximate the first and second oppositely facing edges, respectively and, wherein, a partition recess (e.g., 253) includes first and second opposed edges (e.g., top and bottom edges) that are proximate the first

and second oppositely facing edges of the module 266 when a receivable section of the module is positioned within the recess 253. A mechanical partition coupler including first and second openings (e.g., opening 222 and channel 238) at the first and second edges for receiving the first and second extension members, respectively, is provided.

**[00136]** More specifically, Fig. 29 is a perspective view similar to Fig. 11 above and illustrates an additional exemplary inventive system 218. System 218 includes vertical beam members 12 and intermediate beam members 4 as described above including openings 35 (see again Fig. 10) for securing the beams together, openings 19 and 20 for receiving cover panel clips and securing cover panels 6 and 10, slits 26 for securing other add-on components such as desktop member 5 (see again Fig. 1) and mounting apertures 31 for securing other system components between intermediate beam members 4.

**[00137]** As above, openings 35 are, in at least some embodiments, equi-spaced along the lengths of side beam members 12 so that intermediate cross-beams 4 can be mounted at any of several different vertical heights. In addition, as above, mounting apertures 31 are spaced at every 6 inches along each intermediate beam 4 such that mounting spaces 32 having 6 inch widths are defined between each adjacent set of mounting apertures 31.

**[00138]** In addition to including the beam members described above, system 218 also includes a "pan" assembly 220, a plurality of appliance modules, (e.g., 266, 266a, etc.) and a bezel member 286 (exemplary bezels 286 are best illustrated in Figs. 29A and 32).

**[00139]** Referring to Figs. 29 through 32, pan assembly 220 includes a box shaped assembly open to one side so as to form a pan recess 253 for receiving at least a portion of one or more appliance modules (e.g., 266 in Fig. 29), for providing data and power to the modules when required and for securing the modules within a recess until the modules are affirmatively removed by a system user. To this end, pan assembly 220 includes two features. First, assembly 220 includes a "quick release" mechanical coupling configuration that cooperates with mechanical coupling structure included on appliance modules 266 to secure one or more modules within the recess 253. Second, assembly 220 includes power/data routing structure that, after an initial installation, facilitates automatic power and data linkage whenever a module is mechanically mounted within recess 253. In this regard, referring to Figs.

30A, 30B and 31, the power/data routing structure generally receives power and data via external pan ports (e.g., power via a line 258 linked to a power port 254 and data via data lines 260, 262 linked to data ports 252 and 256) and routes the power and data to power/data couplers 242. Modules 266 that require power and data connectivity are provided with module power/data couplers or connectors (i.e., linkages) configured to mate with the recess power/data couplers or connectors (i.e., linkages) 242 on pan assembly 220. The power/data couplers on each module are juxtaposed with respect to the module mechanical couplers such that when the module is mechanically secured in recess 253, the module and pan power/data couplers align, mate and provide the required connectivity.

**[00140]** Referring still to Figs. 29-32, in addition to ports 252, 256 and 254 and couplers 247, pan assembly 220 also includes a pan housing structure generally identified by numeral 219, pan securing flanges 232 and 234, a pan mechanical coupling configuration described in some detail below and data and power lines (not illustrated) located inside the housing structure 219 that link ports 252, 256 and 254 to couplers 247.

**[00141]** Exemplary housing structure 219 includes an upper external wall member 222, a lower external wall member 224, a first lateral external wall member 226, a second lateral external wall member 228, a rear wall member 230, a front fascia member 225, an upper internal wall member 261, a lower internal wall member 263, a first lateral wall member (not labeled) and a second lateral internal wall member 265. The external wall members 222, 224, 226, 228 and 230 together form a box like structure sized to be receivable within one or a plurality of the mounting spaces 32 (i.e., within a recess or alcove formed by partition 3) defined by a partition 3. Housing structure 219 has a depth dimension D1 that is less than the depth dimension of the beam members (e.g., 12) that form partition 3 and has a height dimension H1 that is slightly less than the height dimension of the partition spaces 32 (e.g., less than 12.6 inches in the exemplary embodiment). In addition, referring to Fig 31, pan 220 has a width dimension of a single mounting space 32. For instance, the exemplary pan 220 illustrated has a width dimension that is four times the 6 inch width of a single mounting space 32.

**[00142]** Front fascia member 225 is generally a rectilinear frame shaped member having an external edge that mirrors the shape and dimensions defined by the internal surfaces of external wall members 222, 224, 226 and 228. Fascia

member 225 is rigidly secured (e.g., via welding or the like) to the internal surfaces of members 222, 224, 226 and 228 along the open edge thereof opposite rear member 230 and forms a rectilinear internal facia edge 293. Fascia member 225 also forms openings (not labeled) for receiving and securely mounting the recess data and electrical connectors also referred to as pan power/data couplers 242 as illustrated. Spacing of couplers 242 is described in greater detail below.

**[00143]** Referring again to Fig. 32, upper internal wall member 261 is a planar rigid member that extends from an upper internal edge of fascia member 225 to rear wall member 230, is generally parallel to upper external wall member 222 and forms an upper channel 271 with upper member 222. Similarly, lower internal wall member 263 is a planar rigid member that extends from a lower internal edge of fascia 225 to rear wall member 230, is generally parallel to lower external wall member 224 and forms a lower channel 273 with lower member 224. Although not illustrated second lateral internal wall member 265 extends from an internal lateral edge of fascia member 225 to rear member 230 and is parallel to and forms a channel with external lateral wall member 228. In addition, the first internal lateral wall member (opposite internal wall member 265) may form a channel with first lateral external wall member 226.

**[00144]** Together internal wall members 261, 263, 265 and the first internal lateral wall member (not labeled) and rear wall member 230 form a pan recess 253 for receiving modules (e.g., 266, 266a, etc.). Recess 253 has a height dimension H2, a width dimension W2 and a depth dimension D2. In the present example height dimension H2 is 11.5 inches and width dimension W2 is 22 inches.

**[00145]** Referring specifically to Fig. 30, recess 253 width W2 is divided into four separate recess spaces 39A-39D, each space having a space width W3 of 5.5 inches. Space 39A is associated with a set of four power/data couplers 242 including two couplers positioned above space 39A and two couplers positioned below space 39A. Similarly, each of spaces 39B-39D is associated with a separate set of four couplers 242, with a pair of couplers 242 above and a pair of couplers below the space. The spacing of the coupler sets relative to their associated spaces 39A-39D is identical for each space 39A-39D.

**[00146]** Referring to Figs. 30A and 33, each power/data connector or coupler 242 includes a keyed extension 248 that includes a plurality of surfaces that slope toward a distal surface 249 that is essentially parallel to front fascia member 225.

Keyed apertures 244 and 246 are formed in surface 249 including a power port 244 and a data port 246. The power and data ports have different keyed shapes that mirror the shapes of male plugs receivable therein. For example, exemplary power port 244 has a square shape to mirror a similarly shaped square male power plug while exemplary data port 246 has a round shape to mirror a similarly shaped round male data plug.

**[00147]** It should be appreciated that, while the illustrated embodiment includes four separate power/data couplers 242 for each of spaces 32A through 32D, in at least some embodiments less or more than four power/data couplers 242 may be provided. In particular, in at least some embodiments, it is contemplated that a single power/data coupler 242 may be suitable for each of spaces 32A through 32D.

**[00148]** In at least some embodiments the channels formed by the internal and external wall members are at least partially open to each other so that power and data lines are routable therethrough to link power port 254 and data ports 252 and 256 with power/data couplers 247. In some embodiments, although not illustrated, it is contemplated that additional structure may be provided within the housing structure channels to electrically and magnetically isolate the power and data lines therein to avoid electromagnetic interference. For instance, in some cases, all electrical lines may be routed to couplers 242 above recess 253 while all data lines are routed to couplers 242 below recess 253. Moreover, to further avoid interference, the power port 254 and data ports 252 and 256 may be provided in different external housing walls.

**[00149]** Referring to Figs. 30A, 30B and 32, the mechanical module coupler configuration that cooperates with module couplers to secure modules in recess 253 includes two openings proximate opposite recess 253 walls, the openings including a channel 238 and a plurality of slots 280. Channel 238 is an elongated upwardly facing channel formed along the lower edge of fascia member 225 and along the entire length of recess 253. Channel 238 is dimensioned to receive a lip extension that extends from a lower edge of each module described in more detail below.

**[00150]** Upper internal wall member 261 forms a plurality of slots or openings 280, a separate slot for each of recess spaces 39A through 39D. In general, each slot 280 is formed proximate a right hand side of an associated space 39A-39D to receive a distal end of a latch member (i.e., a module extension) described below.

**[00151]** Referring to Figs. 29, 30A, 30B and 32, upper flanges 232 and lower flanges 234 are mounted to upper and lower external wall members 222 and 224 and extend upwardly and downwardly therefrom, respectively. Each flange 232, 234 forms mounting openings 240. The flanges 232 and 234 and openings 240 are juxtaposed such that the openings 240 simultaneously align with openings 31 formed by intermediate beam members 4. As in the above embodiments, bolts, screws or self-tapping screws may be used to secure pan assembly 220 via openings 240 and 31. As best seen in Fig. 32, each flange 232 and 234 has a thickness dimension T1.

**[00152]** Referring once again to Fig. 29, in at least the illustrated embodiment, it will be assumed that each of the modules (e.g., 266, 266a, etc.) mountable within the pan assembly 220 will mechanically and electrically link thereto in a similar fashion and therefore, in the interest of simplifying this explanation, the present invention will be described in the context of a single exemplary module 266. To this end, referring also to Figs. 34 through 36, module 266 includes a plurality of module components, typically including electrical and mechanical components, that are housed within a module housing structure 268.

**[00153]** The components within structure 268 will be specific to the type of appliance provided by the module 266. Thus, for instance, in the case of a printer module, components inside structure 268 will include printer components, in the case of a flat screen display, components inside structure 268 will include flat screen components, and so on. Exemplary module 266 is a palm computer recharge and linking module including a receiving space 267 configured and dimensioned to receive a palm type computing device and for linking to the palm computing device to deliver power thereto and to communicate therewith. For the purposes of the present explanation the type of module is unimportant, the important module characteristics being that data and power are required.

**[00154]** Referring to Figs. 32 and 34-38, housing structure 268 generally includes an upper external wall structure 346, a lower wall member 291, first and second lateral wall members 293 and 297, a rear wall member 380, a front fascia member 278, an upper internal wall member 301 and other structures to be described below. Wall members 346, 291, 293, 297, 380 and 278 together define a generally rectilinear space in which most of the other module components reside with lateral members 293 and 297 oppositely facing, upper and lower members 346 and 291 oppositely facing and fascia and rear members 278 and 380 oppositely

facing, respectively. As indicated above, fascia member 278 forms an opening 267 for receiving a palm type computing device. In addition, facia member 278 has first and second lateral module edges 274 and 276. Fascia member 278 also forms an opening 295 for accessing a release button 292 (see Fig. 37) mounted therein. Upper external wall structure 346 forms a recess 322 proximate second lateral surface 297.

**[00155]** Structure 268 has height H3, width W4 and depth D3 dimensions such that at least a rear end of structure 268 fits within one of the recess spaces 39A-39D. In this regard, referring to Figs. 30, 32 and 34, module height dimension H3 is less than recess height dimension H2, module width dimension W4 is similar to space width dimension W3 and module depth dimension D3 is less than recess depth dimension D2 plus the thickness T2 of a bezel member 286 described in more detail below.

**[00156]** Referring to Figs. 32 and 37, upper internal wall member 301 generally extends from an upper internal edge of fascia member 278 toward rear wall member 380. Depending on module 266 requirements, member 301 may or may not extend all the way to rear wall member 380. Member 301 forms an upward facing surface 389 that faces upper wall structure 346.

**[00157]** Referring still to Figs. 32 and 37, button opening 295 is formed by fascia member 278. A cylindrical member 393 extends rearward from the circumference of opening 295 forming a button channel 294 therein. In at least some embodiments, two ribs 296 and 298 are formed on the internal surface of channel 294. A first rib 296 is formed proximate fascia member 278 and a second rib 298 is formed at the distal end of channel 294. Second rib 298 is dimensioned to allow unfettered passage and movement of a distal end 319 of a button 292 therethrough.

**[00158]** Referring now to Figs. 32 and 34-36, structure 268 forms an upper power/data extension member 288 that extends upward from upper structure 346 and that is contiguous with the front fascia 278. Extension member 288 forms a rear surface 279 that faces in a direction opposite that direction of fascia 278. In addition, referring also to Fig. 39, extension member 288 forms two power/data linkages or couplers 284 that are spaced apart so as to define the same dimension as the power/data couplers 242 provided above one of the recess spaces (see 39A in Fig. 30A). Each coupler 284 has a configuration that mirrors the configuration of one of

the pan couplers 242. Thus, in Fig. 39, coupler 284 includes a recess 336 formed by a plurality of surfaces 338 that slope toward a flat surface 383 where the slopes and dimensions of surfaces 338 and 383 are similar to the slopes and dimensions of the surfaces that define keyed extension members 248 (see again Fig. 33).

**[00159]** Male plugs 340 and 342 are located inside recess 336 where the plugs 340 and 342 have shapes and dimension that match the shapes and dimensions of the ports 244 and 246 formed by extension member 248. For instance, in the illustrated example, a square power plug 340 is juxtaposed with respect to a round data plug within recess 336 such that the plugs are simultaneously receivable within similarly shaped ports 244 and 246 when extension 248 is inserted in recess 336.

**[00160]** Referring still to Figs. 32 and 34-36, structure 268 also forms a lower power/data extension 290 that extends downward from lower wall member 291 and that is contiguous with front fascia 278. Extension member 290 forms a rear surface 385 that faces in a direction opposite fascia 278. As in the case of upper extension 288, lower extension 290 forms two spaced apart power/data couplers 284 similar to the couplers 284 described above. Couplers 284 formed by lower extension 290 are spaced apart so as to define the same dimension as the power/data couplers 242 provided below one of the recess spaces (see again 39A in Fig. 30A).

**[00161]** Each of the power/data extensions 288 and 290 has a thickness or depth dimension T4 that is generally equal to the thickness T2 of bezel 286. In addition, where a typical panel 6, 10 has a thickness of T5 (not illustrated), the combined thickness T3 of one of flanges 232 or 234 and extension thickness T4 is equal to the panel thickness T5. Similarly, the combined thickness of one of flanges 232 and 234 and bezel thickness T2 is equal to panel thickness T5. In this way, when a pan is mounted to a partition and a bezel 286 is added to cover flanges 232 and 234, a front face 287 of bezel 286 will be flush with the front face of an adjacent panel 6, 10 and will also be flush with the front facia 278 of any module(s) received within recess 253.

**[00162]** While one exemplary module 266 is described here in detail, it should be appreciated that other module configurations are contemplated that have different sizes, power/data coupling configurations and so on. For instance, referring to Fig. 29, while module 266 is a 5.5 inch wide module, exemplary module 266a is a 16.5 inch wide module that is designed to occupy three of spaces 39A through 39D (e.g., to occupy spaces 39B-39D). Here, because module 266a occupies three spaces

when installed, module 266a may link up to any of several different power/data couplers 242 or sub-sets thereof. For instance, module 266a may only link to coupler 242a for power and data, may link up to coupler 242a for power and to coupler 242b for data, may link to coupler 242a for power and to both of couplers 242b and 242c for data, may link to both couplers 242a and 242c for both power and data, etc. Where a module occupies a space (e.g., 39B) associated with a coupler 242 but does not link thereto, it is contemplated that keyed apertures without male plugs would be provided in the power/data extensions 288, 290 to accommodate the couplers 242.

**[00163]** Referring once again to Figs. 32 and 34-36, module 266 includes several features that cooperate to secure module 266 within one of spaces 39A-39D. First, module 266 forms a rigid extension or lip member 282 that extends from a lower edge of lower power/data extension 290 to a distal edge 270. Lip member 282 is recessed back from the front surface of fascia member 278 and has a thickness dimension (not labeled) such that lip member 282 is snugly receivable within channel 238 formed by pan assembly 220 (see Fig. 32).

**[00164]** Second, referring specifically to Figs. 32, 35, 37, 38, module 266 also includes a mechanical coupler or latching mechanism generally identified by numeral 264. Latching mechanism 264 includes an activation button 292, a button spring 302, an "L-shaped" lever 306, a pivot post 312 and a biasing member or lever spring 316. Button (also referred to as a release member) 292 is generally a cylindrical member having an annular rib member 300 that extends laterally therefrom about one third the way along its length and terminating at a distal end 304 that forms a first cam surface also referenced herein by numeral 304. The cylindrical member is dimensioned to pass through the restricted areas defined by ribs 296 and 298 while rib member 300 is dimensioned to restrict movement therethrough. The end of button 292 opposite distal end 304 forms an interface section or surface.

**[00165]** Spring 302 is a helical spring and is sized to be receivable around the cylindrical member that comprises part of button 292. Button 292 is mounted within member 393 such that rib member 300 is disposed between ribs 296 and 298 with button 292 facing out of opening 295 and distal end 319 extending from member 393. Spring 302 is positioned between rib member 300 and rib 298 and biases button 292 into a deactivated or extended position as illustrated in Fig. 37. When the externally accessible surface of button 292 is pressed, spring 302 coils, distal end

304 is forced along an activation axis 397 (see Fig. 38) and button 292 assumes a retracted position.

**[00166]** Pivot post 312 is mounted to surface 389 and includes a distal end 314 that is generally juxtaposed along button activation axis 397. Latch member 306 includes a shoulder member 308 and an arm member 310 that form a 90° angle. A distal end 326 of shoulder member 308 forms a second cam surface also referred to by numeral 326. A distal end 318 of arm member 310 forms a latch surface 319 and a third cam surface 399. Latch surface 319 generally faces in the same direction in which shoulder member 308 extends from arm member 310 while third cam surface 39A generally faces in the direction opposite latch surface 319.

**[00167]** Latch member 306 is mounted for pivotal motion to the distal end 314 of post member 312 approximately mid-way along the length of shoulder member 308 and so that second cam surface 326 generally faces first cam surface 304 of button 292. Shoulder member 308 is dimensioned such that, when aligned along the activation axis 397, the first and second cam surfaces 304 and 326, respectively, make contact. Arm member 310 is dimensioned and juxtaposed such that distal end 318 extends out slot 322 (see Figs. 35 and 37).

**[00168]** Latch spring 316 is mounted between a push surface 320 formed by shoulder member 308 opposite arm member 310 and a push surface 324 rigidly supported by surface 389 (i.e., supported by member 301). Any mechanical mounting structure (e.g., posts, recesses, etc.) that allows spring flexing may be used to mount spring 316. Spring 316 is partially loaded so that spring 316 biases latch member 306 toward the de-activated position illustrated in Fig. 37 where extension or distal end 318 extends out slot 322.

**[00169]** Referring specifically to Fig. 37, latch arm member 310 is dimensioned so that, when module 366 is received within recess 253 (see also Fig. 32) and is properly aligned, distal end 318 extends at least partially through slot 280 formed by the upper internal wall member 261.

**[00170]** Referring now to Figs. 29A and 32, the illustrated embodiment includes one or more bezels 286, 286a that are generally frame shaped assemblies including four generally straight members that form a rectilinear frame. The external shape formed by and dimensions of the frame are similar to the shape and dimensions of a panel 10. Thus, for instance, bezel 286a in Fig. 29A has dimensions and an external

edge shape similar to that of panel member 10. In another embodiment a bezel may be twice as long as bezel 286a of Fig. 29A and may be useable with the pan assembly 220 in Fig. 29A without requiring panel member 10.

**[00171]** Which size bezel 286 is used with an assembly is a function of the size pan assembly employed, the number of modules used with the pan and the sizes of the modules used with the pan. For example, referring to Fig. 29A, where pan 220 is a 24 inch pan having a 22 inch recess, where only one 5.5 inch wide module is mounted within recess 253, the bezel 286 would be sized to finish around the single module and a panel 10 to cover the remainder of the pan would be employed. As another example, where two 5.5 inch wide modules are mounted adjacent each other in recess 253, a different bezel 286 would be sized to finish around the two adjacent modules and a panel similar to the panel 10 illustrated in Fig. 29A would be employed to cover the remainder of the pan. As yet one other example, where one 11 inch wide module and two 5.5 inch wide modules are mounted within pan recess 253, a large bezel 286 would be employed to finish around the modules and no panel 10 would be required.

**[00172]** Although not illustrated, it is contemplated that bezels 286 would each include clips on a rear surface similar to the clips provided on the rear surfaces of panels 6 and 10 where the clips are receivable within holes 19, 20, etc., for mounting the bezels 286 to the partition assembly. Other coupling methods are also contemplated.

**[00173]** Referring to Figs. 29 through 32, to mount pan assembly 220 within a partition recess, pan assembly 220 is aligned with the recess with flange holes 240 aligned with beam holes 31. Next, screws, bolts or the like are placed through the aligned holes to fasten the assembly 220 to the partition. Data and electrical lines 260, 262 and 258 can be linked up to assembly 220 either before or after mounting to the partition.

**[00174]** Referring now to Figs. 29 through 39, to mount module 266 within one of the spaces 39A through 39D defined within recess 253, module 266 is both vertically and horizontally aligned with the space in which module 266 is to be inserted. Here, it will be assumed that module 266 is to be inserted into space 39A as illustrated in Fig. 29. Once module 266 is aligned with space 39A, the back end of module 266 is placed within space 39A and lip extension 282 is placed within recess 238. Next, module 266 is rotated in a counterclockwise direction as

illustrated in Fig. 29. During rotation, power/data couplers 242 are received within the power/data couplers 284 formed in rear surfaces 279 and 385 of the power/data extensions 288 and 290, respectively. In addition, during module rotation back into recess 250, referring also to Figs. 35, 37 and 38, third cam surface 399 of arm member 310 contacts the internal surface 281 of recess 253 and is forced against the force of spring 316 at least partially into slot 322. Eventually, once rear surface 279 contacts the surface formed by front fascia member 225, distal end 318 of lever member 306 is aligned with slot 280 and is therefore biased therethrough by spring 316. Once biased through slot 280, latch surface 319 formed by distal end 318 contacts a facing surface formed by slots 280 and securely hold module 266 within space 39A.

**[00175]** After modules 266 have been mounted within recess 253, an appropriate bezel 286 is selected and mounted to the partition beams so as to frame the mounted modules. Thereafter, if necessary, a panel 10 may be selected to cover any unused space (e.g., 39D) within recess 253.

**[00176]** To remove a mounted module 266, referring again to Figs. 32, 27 and 38, button 292 can be pressed thereby unlatching arm member 310 from slot 280. With member 310 unlatched, the top end of module 266 can be pulled from recess 253 and module 266 can then be removed. To aid in removal, in some cases, a handle or other member may be provided on front facia 278. In the alternative, a spring device may be provided between the top rear end of module 266 and the top rear end of rear pan surface 230 that forces module 266 from recess 253 when member 310 is unlatched.

**[00177]** In at least some embodiments of the present invention indicia or mechanical guides are provided for aligning modules with recess spaces (e.g., 39A, 39B, etc.). To this end, Fig. 41 illustrates a partial plan view of an exemplary channel 238 including printed or embossed indicia markings 500, 502, etc., along the length of channel 238 that mark off widths equal to the module width dimension W4 and that are juxtaposed with respect to the spaces 39A-39D such that the indicia indicate space boundaries. Here, by aligning a module between indicia 500, 502, etc. the module is aligned with a space 39A-39D and hence with mechanical, power and data couplers.

**[00178]** Referring to Fig. 42, a plan view of a plurality of channels 506, 508, 510 and 512 that are used instead of single channel 238 is shown. Here, each separate

channel 506, 508, etc. has a length dimension L1 similar to the length dimension (not labeled) of the lip extension member 282 that extends from one of the 5.5 inch modules 266. In this case alignment is aided as lip 282 placement is restricted to a specific location associated with one of the smaller channels 506, 508, etc. Where channels 506, 508, etc are aligned with spaces 39A, 39B, etc., the channels mechanically ensure proper coupler alignment.

**[00179]** In at least some inventive embodiments a locking mechanism is provided for locking modules within recess 253 to provide some level of security. To this end, referring to Figs. 43-47C, one locking mechanism is illustrated wherein locking features have been added to the mechanical latch mechanism of Figs. 37 and 38. Many of the features of the mechanism illustrated in Figs. 43-47C are similar to the features of Figs. 37 and 38 and therefore, in the interest of simplifying this explanation, are not again described here in detail. Referring to Figs. 37 and 47A, the button assembly of Figs. 47A is meant to replace the similarly appearing button assembly of Fig. 37 and to cooperate with a latch member 306 and biasing spring 316.

**[00180]** Referring now to Figs. 43, 44 and 45, button 520 is generally a cylindrical rigid member having a button surface 522 and a distal cam end 524. A key receiving opening 526 is formed within surface 522 for, as its label implies, receiving a key. When a proper key is placed within opening 526, the key can be used to rotate button 520 about a button axis 528 (see also Figs. 47A-47C). Two annular ribs extend laterally from button 520 including a full rib 530 and a partial rib 532. The full rib 530 is located approximately one-third the way along the length of member 520 from surface 522 and partial rib 532 is spaced apart from rib 530 approximately the width of the rib 530. As the labels imply, rib 530 is a complete annular rib while rib 532 is a partial annular rib including two sections 532A and 532B that extend in opposite directions and that are spaced apart around member 520.

**[00181]** Referring now to Figs. 37 and 47A, the module structure that receives button 520 is similar to the structure that receives button 292 including a cylindrical member 393 that forms a button channel 294 and first and second full annular ribs 296 and 298. In addition, the Fig. 47A embodiment includes a third annular rib 540 or more specifically, a partial annular rib 540 that includes two rib members 540A and 540B that extend inwardly toward each other and that define spaces 542 and

544 therebetween. Rib members 540A and 540B are positioned between ribs 296 and 298 and are spaced from rib 296 a dimension slightly larger than the thickness of rib members 532A and 532B (see again Figs. 44 and 45). Importantly, spaces 542 and 544 are large enough for rib members 532A and 532B to pass through when members 532A and 532B are aligned therewith as in Fig. 46.

**[00182]** Referring again to Fig. 47A, button 520 is mounted within channel 294 along a button axis 528 with ribs 532 and 530 between ribs 296 and 298 and with a spring 302 between ribs 298 and 530 to bias the button into an extended position. When extended, rib 530 contacts rib members 540A and 540B and rib members 532A and 532B are generally positioned between rib members 540A and 540B and rib 296. In Fig. 47A button 520 is shown in a locked orientation where members 532A and 532B are aligned with rib members 540A and 540B. It should be appreciated that when in the locked orientation, when surface 522 is pressed, members 540A and 540B restrict movement of members 532A and 532B along axis 528 and hence do not allow removal of the associated module from recess 253.

**[00183]** Referring to Fig. 47B, if a proper key is inserted into opening 526 and button 520 is rotated 90°, members 532A and 532B align with openings 542 and 544 (see also Fig. 46). When so aligned, when surface 522 is pressed, members 532A and 532B pass through openings 542 and 544 and button 520 moves along axis 528 to de-latch the associated module from recess 253. Other locking mechanisms are contemplated.

**[00184]** In some cases a complete pan structure may not be provided and instead simple rails may be substituted. To this end, Fig. 40 illustrates another embodiment including upper and lower rails 450 and 452, respectively. Lower rail 452 simply forms a channel 454 for receiving a module lip 282 and does not include power/data couplers. Upper rail 450, it is contemplated, includes structure similar to the upper part of Fig. 32 to facilitate power/data linkage and mechanical coupling. Thus, rail 450 would, at least in some embodiments, include wall members 222, 261 and portions of facia member 225 and rear member 230 as well as couplers 242 and some mechanical component that forms a latch surface 318 (see also Fig. 38). In Fig. 40 rail 450 only includes one power/data coupler per 5.5 inch space 460A-460D.

**[00185]** In the foregoing description, it will be readily appreciated by those skilled in the art that modifications may be made to the invention without departing

from the concepts disclosed herein. Such modifications are to be considered as included in the following claims, unless the claims by their language expressly state otherwise. For example, in at least some embodiments, instead of forming channels (e.g., 271) within the pan housing assembly for routing power and data lines, the power and data lines may be directly linked to each of couplers 242. As another example, couplers 242 may be provided along only the top or the bottom of a pan recess and, in some cases, only one coupler 242 may be provided for each recess space (e.g., 39A).

**[00186]** In addition, while the invention has been described above in the context of a modular partition wall system, it should be appreciated that pans or the like (e.g., rails) may be mounted within more conventional wall systems (e.g., 2x4's and drywall) as well as in a floor or ceiling substructure or even in a furniture substructure (e.g., a desk). In these cases modules can be placed virtually anywhere power and/or data linkage is required to facilitate quick and efficient customization of space.

**[00187]** Moreover, other embodiments mya not require a bezel 286. For example, in some cases modules may include extensions that take the place of the bezel to provide a more finished appearance. Bezel-less embodiments are seen as particularly advantageous where two or more pans are positioned next to each other so that adjacent modules need not be separated by one or more bezel members.

**[00188]** Furthermore, in some embodiments at least a portion of at least some modules may extend from a partition or pan recess while another portion of the module is received within the recess. Thus, for instance, in the case of a printer it may be that printer components cannot be positioned entirely within a partition recess and therefore that at least some components have to protrude from the recess.

**[00189]** In addition, in the case of some modules, the modules may not require data linkage via the recess either because the modules do not require data connectivity or because some other communication protocol (e.g., wireless) is employed. Here, it is contemplated that at lease some modules will only include electrical/power couplers and that, in at least some embodiments, some recess spaces may only be provided with power couplers and not data couplers.

**[00190]** Moreover, while the pan assembly 220 described above is a 24 inch pan, other pan sizes including multiples of 6 inches are contemplated that can be

used with a set of filler panels 10 of standard sizes. Thus, pans or other coupling structures (e.g., rails) may have 6 inch, 12 inch, 18 inch, 24 inch, 30 inch, 36 inch, etc. dimensions to accommodate differently sized modules and different numbers of modules.

**[00191]** In addition, while modules are described above as including a single latching assembly 264 (see Fig. 37), some embodiments may include more than one latching assembly where appropriate or a single latching assembly that interacts with pan slots or other similar structure at more than one location (e.g., may interact with two or more slots 280 (see again Fig. 30A)).

**[00192]** Moreover, in at least some embodiments where power is required, it is contemplated that low voltage may be provided to a panel system or the like in the form of a low voltage rail assembly (similar to a tack lighting assembly). Here, referring again to Fig. 29, a low voltage rail may be provided along the upper edge of each intermediate member and the pans (e.g., 220 above) may be configured such that when a pan is mounted within a recess the pan links to the low power rail. In at least some embodiments the pans may likewise include pan mounted rails so that low voltage power can be provided to modules received thereby. For instance, referring again to Fig. 30A, a low voltage rail may be provided within channel 238 and modules (see 266 in Fig. 29) may be configured so that the downward extending member 282 is automatically linkable to the low voltage rail within channel 282 when received therein. In this case the electrical connectors or ports described above would not be required to provide power. In other cases the low voltage power may be provided via electrical connectors like those described above (see again Fig. 29). Other low voltage linkage assemblies are contemplated.

**[00193]** To apprise the public of the scope of this invention, the following claims are made: